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16. Abstract

The stresses of air travel on medical patients are described as well as the airlines' obligation with respect to transporting patients. A number of heart, circulation system and other diseases are evaluated with respect to air travel safety.

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FITNESS FOR AIR TRAVEL — THE MEDICAL POINT OF VIEW

H. H. Renemann, K. Wink and H. Reindell

Even the ill, the invalid and very old people are increasingly desirous of being transported easily and safely by air, since the number of air trips per year keeps steadily increasing in this age of jet planes. We will discuss when, from a cardiological point of view, air travel is contraindicated, and when precautions are indicated during the trip. /1311*

The airplane converts days of travel into hours. Half a day's travel by car or by train takes only an hour by air. Especially for sick people, the short duration of the trip is the greatest boon. But often the patient or his family overlook the fact that a sickness can be made worse by the flight, or become worse as a result of the journey by air. Every year there are deaths on commercial air flights of passengers with circulatory or cardiac complaints.

SPECIFIC STRESS FACTORS ON COMMERCIAL AIRCRAFT

Medical evaluation of fitness for air travel must take account of a number of stress factors that affect healthy people and have an even more pronounced effect on passengers who are sick. On the great long-distance flights from Frankfurt to the Bahamas

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* Numbers in margin indicate pagination in original foreign text.

or Los Angeles or Anchorage, the duration of the flight is eleven hours or more, non-stop. A series of several shorter long-distance flights (with landing stops of about 45 minutes) would not offer any significant relief to the sick person.

Emotional stress:

The tension of waiting, of fear or anger, affect the cardio-vascular situation, especially in the case of cerebral sclerotic patients with emotional instability. Emotional tension stressing the circulation is especially likely to appear in patients who are flying for the first time, or are excitedly anticipating the situation of traveling. According to medical statistics, there were 55 passenger deaths due to heart failure at the J. F. Kennedy Airport in New York from 1955 to 1965, of which 53 were confirmed by autopsy. 44% died before the beginning of the flight, 29% during flight, and 27% after the flight [6].

The altered air-pressure in the cabin at altidudes corresponding to 2100 to 2400 meters is not healthy, particularly for patients with coronary and cerebral sclerosis or pulmonary /1312
emphysema, who already suffer discomfort at climatically moderate mountain heights [8]. In regions of South America, Africa, Asia, where transportation is less developed, passenger planes without pressurized cabins, i.e., DC-3, are still in service. In flying over the Andes, for instance, such planes may fly at altitudes as high as 4000 meters. The use of an oxygen mask by old and infirm patients under these circumstances is questionable. In modern jet airplanes with pressurized cabin, the maximum pressure difference must, from design considerations, be kept down to values of the order of 0.53 - 0.63 atmospheres. In the cabin, which is designed as a pressure chamber, there is thus, at a traveling altitude of 11,900 meters (39,000 feet), a

relative excess pressure of easily half an atmosphere as against the outside air. At this altitude, the cabin pressure in a B707 corresponds to the pressure of the normal atmosphere at 2300 meters. The oxygen partial pressure in the air in the cabin (dry) is then 140 mm. Hg., representing a drop of 23% as against the corresponding oxygen partial pressure at sea level.

The air in the cabin on long trips is necessarily dry, since the moisture content in the air of the upper troposphere is already very low. Outside air at -50 to -56.5° C enters the machine and is heated temporarily to about 270° C to 370° C, and is then adiabatically cooled to about +20° C, reducing the relative humidity of the air in the cabin to less than 10%. Especially older patients with dry bronchitis and without medical aid may, as a result, be subjected to persistent coughing, which represents an additional strain on the heart.

The change in climate after flights to places where the temperature is significantly higher and the moisture content is much higher at the same time represents a considerable strain on the circulatory system of persons with organic heart and lung disease. Long-distance flights over the equator bring with them a change of season, which in the case of long distances is quite abrupt. In addition, the change in environment often involves a change in food and increased danger of exposure to infectious diseases, especially intestinal infections. This involves a multiple threat for the cardiac patient.

The change in time zones resulting from long voyages in an easterly or westerly direction leads to desynchronization of the circadian rhythms, especially of the waking and sleeping rhythm and the rhythmic variations in body temperature on internal secretions. Already after a flight of 75° of longitude, the

discrepancy between the "internal"clock and local time amounts to five hours; resynchronization takes several days. The discrepancy between "internal clock" and local time after a flight from West Germany to Chicago amounts to seven hours, to Los Angeles nine hours, to Bangkok six hours, to Sydney ten hours. The patient will be breakfasting there at the time when he was beginning his night's rest in Germany.

THE BASES OF MEDICAL EVALUATION

Medical evaluation of the fitness for flight is based on the guidelines of the International Air Transport Association (IATA), the recommendations of the WHO, and on experience gained in practice [1]. According to the IATA guidelines: the flight captain or the company issuing the ticket may refuse to undertake the transportation of a passenger, may exclude him from further transportation by airplane at an intermediate landing point, or may cancel his reservation, if:

a) the passenger, because of his mental or physical condition (including frailty due to old age), would require special assistance from the company, or

b) the passenger, because of his mental or physical condition, causes unpleasantness or inconveniences to the other passengers, or

c) the passenger, as a result of his mental or physical condition, would endanger himself or others or their property.

If the physical or mental condition, the current state, or the age of a passenger represent a health risk, the company, if it transports the passenger, does not accept responsibility for any worsening in the condition, or the effects of any such worsening

including death, for his falling ill, for injury, or physical disability — insofar as these are due to the risks mentioned.

The air transportation companies do not refuse special assistance on the way to the airplane, during flight, and after the flight, provided that a written medical opinion by a doctor authorized by the company certifies the patient's fitness for air travel.

Determination of fitness for air travel requires a special determination of the possibility of a situation's developing during the flight that would represent a danger to the life of the patient: this would cause an interruption in the journey and considerable inconvenience for the other passengers.

EVALUATION OF CARDIAC AND CIRCULATORY PATIENTS

Some three quarters of all illnesses causing distress during flight are cardiac and circulatory disturbances. For every 1.5 million air passengers, there is one death almost always connected with cardio-vascular disease [2].

Coronary patients who have had no infarction, if in Class III or IV of the degrees of severity in the classification of the New York Heart Association, are not fit for air travel. Patients of degree III feel well when at rest and have anginal symptoms even with light normal activity. Patients of degree IV experience anginal symptoms when at rest, e.g., postprandially, and the symptoms are aggravated by light physical activity.

Patients of degree II have stenocardiac symptoms with moderate physical exertion. With these it must be taken into account that respiratory insufficiency or additionally occurring anaemia (hemoglobin below 12%) under reduced oxygen partial pressure

could lead to earlier hypoxidosis of the myocardium.

Conditional fitness for air travel, e.g., if accompanied by a doctor and if portable oxygen apparatus is taken along, is possible for patients at the boundary between degrees II and III, especially on short trips.

After an infarction, the following recommendation has proved itself in practice: after the subsequent reactive phase in the EKG, patients can be regarded as fit to fly in the late stage (scar stage) if they have been symptom-free for at least six weeks and the cardiological check-ups indicate a favorable prognosis. The patients must be free of stenocardiac symptoms during light physical activity. Günther [2] recommended that after infarctions with a mild clinical picture and without shock and slight dilation in the EKG three to four months after the event no contraindication against flying should be accepted. If there was an extended infarction with a severe clinical picture, then there is still a relative contraindication three months after the acute event [2]. In exceptional cases, the doctor treating the case and the doctor authorized by the airline must examine carefully whether conditional fitness for air travel, i.e., with a doctor in attendance and portable oxygen apparatus, perhaps even lying down, can be approved.

After severe infarctions in the late stage, the question of possible air travel without an accompanying doctor should be considered at the earliest six months after the event and with due consideration of the patient's progress. Not only the course of the disease and the current degree of clinical severity must be taken into account, but also the probable duration of the air trip, a foreseeable stressful change of climate, or a considerable change in time zone.

The coronary patient rated fit for air travel should not ingest large amounts of food before or during the flight, nor any carbonaceous, bloating drinks. He should avoid all stress, and for this reason alone, arrive at the airport on time. If circumstances require, he should be previously sedated, i.e., before arrival at the airport [4]. /1314

Cardiac insufficiency with dyspnea at light levels of normal activity and with dyspnea at rest, is a contraindication for longer airplane trips. With cardiac insufficiency, the reaction threshold for hypoxemia is reduced. Even at low altitudes, there can be tachycardia when at rest, and sometimes an increase in the diastolic blood pressure [9].

Carpulmonale to a severe degree is not compatible with air travel. Hypoxia leads to increased resistance in the terminal capillaries [9]. Clinical findings, especially the degree of dyspnea at rest, of cyanosis, and response to stress, will be decisive.

Hypertonia: Patients with compulsory high pressure are endangered especially in case of stenosis of larger blood-vessels, if the blood pressure is reduced by medication during altitude hypoxia. With simultaneous left-side cardiac insufficiency, when the oxygen partial pressure in the air available for breathing, the compensatory increase in the heart-time-volume is restricted. Of greater decisive value than an arbitrarily established blood pressure maximum (say 220/120 Torr) in cases of established hypertonia, will be the clinical findings: the existence of encephalopathy, severe nephrosclerosis, or severe retinal changes [3].

Hypotonic circulatory disturbances: Patients with abnormally low blood pressure or with orthostatic hypotonia are not endangered. Doubts might arise only in the case of older arteriosclerotic patients. /1315

Congenital cardiac defects: Children and adults are fit for air travel if their circulatory compensation is adequate [2]. In right-left-shunt, the right ventricle is additionally stressed under altitude hypoxia [5]; the possibility of failure of the right side of the heart must be examined. Otherwise, minor cyanosis due to blood mixture is not a contraindication. Altitude hypoxia is relatively well tolerated in long-lasting blood mixture cyanosis, oxygen utilization is increased. Portable oxygen apparatus is nevertheless recommended as a precaution.

Acquired cardiac defects: Here the same clinical criteria apply as in cardiac insufficiency. In evaluating the clinical signs of borderline cases of cardiac insufficiency, X-ray enlargements of the heart would provide the decisive contraindication. Mostly it indicates myocardiatic heart muscle damage primarily of rheumatic origin, or decompensation [7].

Hemodynamically active cardiac rhythm disturbances: With a tendency toward paroxysmal tachycardia, the patient may be conditionally fit for flight, i.e., only if accompanied by a doctor. Absolute arhythmia calls for adequate pretreatment with digitalis if a rapid form is present. With a third degree AV Block 3, the patient is not fit for air travel because of the danger of Adams-Stokes attacks unless fitted with a pacemaker.

Patients with pacemakers: In Germany today, there are some 18,000 patients with implanted pacemakers. Indications in the literature regarding disturbance by radar impulses in the vicinity of airports do not apply to the metal-encapsulated

demand and stand-by models. Short-term frequency effects from radar or magnetic field weapon detectors during safety checks can be avoided. In the airplane no disturbance need be feared, neither through changes in cabin air pressure nor from electromagnetic fields.

OTHER CONDITIONS

Open tuberculosis or other infectious disease endangering other passengers is a contraindication. Considerable inconvenience to the other passengers or even disturbance of the flight by an unplanned landing is provided by the occurrence of an obstetric situation on board. Pregnant women should not fly in the last four weeks before the anticipated delivery date. Imminent abortion is also a severe contraindication. On the other hand, recently operated patients — in special cases and after careful evaluation of the risk — on a stretcher and accompanied by a doctor, in a separate section of the cabin ("stretcher case"), can be moved from Munich to Hamburg or Athens with less wear and tear than by rail or road.

Patients with epilepsy require the opinion of the doctor treating them. Despite customary medication, certain patients, as a result, e.g., of hyperventilation, might have an attack during the flight. Patients with a decreasing psychosis might be conditionally fit to travel if traveling under appropriate medication and accompanied by a suitable doctor in whom they have confidence. Patients with severe cerebral sclerosis should — unless there is already a cardio-vascular contraindication — only travel if accompanied: left to their own devices, they may decompensate psychically at planned or unplanned stops, and especially when changing planes at the large international airports. To the surprise of their relatives, they sometimes do not land at their destination but in a psychiatric ward instead. /1316

Those with a tendency to temporary cerebral seizures are not fit for air travel. Carefully considered exceptions to this rule should only be made to return a patient from abroad, with a doctor or companion. After cerebral infarction, the clinical course is decisive for the time of return in a commercial flight. Consciousness must be completely lucid again, the fluid must be normal. Whether the patient travels lying or sitting depends upon the type of residual paresis. Here, and with patients having intracerebral and subarachnoidal hemorrhages (aneurysm, angioma, hypertonia), determination is often difficult. The doctors treating the patients are consulted by the medical services and contract doctors of the great airlines, when the fitness for air travel of ill passengers is being considered.

MEDICAL SERVICE OF THE AIRLINES

In principle, a patient lets the airline know several days before a planned voyage that he requires a medical fitness report. The ticket agency of the airline gives him a questionnaire which his doctor, after release from his obligation to professional secrecy, fills out. The health questionnaire is then routed to the medical service of the airline, which then makes the determination whether and in what manner (lying, sitting, accompanying doctor, nursing personnel, etc.) the air journey can be carried out, in many cases, after conference with the patient's doctor. The large airline companies, like Lufthansa, have contract doctors at almost all places they serve.

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